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An assessment of the evaluation needs of trade and industrial and technical vocational instructors

Donald William Leu
Iowa State University

An assessment of the evaluation needs of trade and industrial and technical vocational instructors

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Donald William Leu

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CHAPTER I.

INTRODUCTION

The term evaluation, in its broadest sense, has many interpretations. According to Alkin (1969),

> Evaluation is the process of ascertaining the decision areas of concern, selecting appropriate information, and collecting and analysing information in order to report summary data useful to decision-makers in selecting among alternatives (p. 2).

Stufflebeam (1973) defined evaluation as "the process of delineating, obtaining and providing useful information for judging decision alternatives" (p. 17). The key words in both definitions are "decision" and "alternatives".

Educational evaluation can be defined as the judging of the worth and merit of education or an educational program. According to Cronbach (1963), "we may define evaluation broadly as the collection and use of information to make decisions about an educational program" (p. 672). Cronbach went on to name three types of decisions for which evaluation is used:

1. Course improvement: deciding what instructional materials and methods are satisfactory and where change is needed.

2. Decisions about individuals: identifying the needs of the pupil for the sake of planning his instruction, judging pupil merit for purposes of selection and grouping, acquainting the pupil with his own progress and deficiencies.

3. Administrative regulation: judging how good the school system is, how good individual teachers are, etc. (p. 673).

The classroom teacher must be competent in making the first two types of decisions. An Iowa Department of Public Instruction (1977) publication stated:

> The ability to evaluate one's own teaching procedures and teaching function separates a highly skilled teacher from one who is mediocre or simply acceptable.
>
> The task of the teacher is to assess the potential of learners and to determine their progress during instruction (D-43).

The ability of the teacher to perform these evaluation tasks can only come from a sound base of knowledge relative to needed educational evaluation theories and methodologies.

In recent years much has been written concerning both program and student evaluation. Both aspects of evaluation abound with differing opinions as to the best methods and techniques. It must, then, be the function of teacher education to help the instructor understand the theories and methods of both program and student evaluation most directly related to his needs, thus allowing the individual to arrive at a system of evaluation that has meaning for him and can be defended.

Vocational instructors are, by legal mandate, required to evaluate their students' progress as well as their programs. In vocational education, all three domains of learning--cognitive, affective and psychomotor--must be evaluated. This creates special evaluation needs for the instructors. These needs give rise to

requirements of vocational evaluation courses. Therefore, specialized content as well as training methods are needed.

To develop and maintain this specialized content, vocational teacher educators must constantly keep abreast of the needs of their students and prospective students. If the needs of the instructors are periodically assessed and compared to the content of vocational evaluation courses, needed changes can be made in those courses to help assure that what is being taught is what should be taught.

Statement of the Problem

The problem of this study is to determine the congruence between the competencies in evaluation perceived as needed by vocational instructors and the competencies included in vocational teacher education courses in evaluation.

Statement of Purpose

The purpose of this study was to determine: (1) vocational instructors' needs in evaluation, and (2) whether those needs are being met by professional evaluation courses.

Need for the Study

The need for this study emanated from three basic considerations. First among evaluation theorists there are varying opinions as to what evaluation methods are needed in various educational disciplines.

Second, there is a need to update vocational teacher educators. Finally, there is a more general need to do research in vocational education which is one of the principles of vocational education.

One of the main disagreements in student evaluation theory is a concern with norm-referenced and criterion-referenced measurement. Ebel (1971) stated:

> The good teacher knows and is able to do thousands of things that he hopes to teach his students. Some of them are recorded in the readings he assigns or in the lecture notes he uses. . . .Why should he labor to translate all these detailed elements of achievement into statements of objectives?. . .how formal, rigid and dull his teaching would become (p. 284).

Ebel is not objecting to criterion-referenced measurement as much as to a teacher having to specify objectives in all educational courses.

Block (1971), on the other hand, disagreed with the widespread use of norm-referenced measurement when he stated, "A rough idea provided by norm-referenced measurements of what each pupil has not learned will not do" (p. 17). Block, as Ebel, is not completely rejecting the form of measurement, but to the application. Both forms of evaluation have their purpose. It remains, however, essential for one to choose one form or the other depending on what is to be evaluated and what use the resulting data are to be put.

Theories and models concerning program evaluation are numerous, too numerous to allow adequate coverage in one or two vocational teacher education courses in evaluation. Teacher educators must

choose among the theories and require knowledge of instructor's needs in order to do this.

The second aspect of the need for this study stemmed from the rapidly changing technology of this country. Vocational teacher educators must keep abreast of these changes. Miller and Kazanas (1974) stated:

> Rapidly changing societal demands and technological capacity emphasize the need for an additional commitment to the development, maintenance and utilization of the skills and abilities of our human resources. The most important ingredient in meeting that commitment is an educational system which includes an integrated vocational education component. This requires, among other things, vocational teacher educators who are prepared to assist teachers in the development of competencies relevant to the changing and expanding role of vocational education (p. 39).

Miller and Kazanas went on to say:

> The in-service preparation or updating of vocational teacher educators is another problem that has not been dealt with effectively (p. 41).

As the functions of vocational education change, so do the functions of vocational teacher educators. Current information as to the needs of vocational instructors must be obtained to assure that the changing functions are carried out in a relevant manner.

Finally, the need for research in vocational instructor competencies stems from a general need for research in vocational education. Roberts (1965) stated:

> A. . .kind of research of importance in vocational education is that carried on for the purpose of discovering better ways of carrying out present educational practices and developing new ideas for new practices. This type of research requires the use of judgments of competent persons who are working in the field of vocational teaching (p. 534).

Research is needed to provide information necessary to further vocational education. Persons working closely with vocational education students must be considered as a primary source of this information.

Research Questions

The nature of this study made it appropriate that research questions be asked rather than positing research hypotheses.

Question 1. Do trade and industrial and technical instructors' perceived needs in evaluation differ from the content of vocational teacher education courses?

Question 2. Do trade and industrial and technical instructors' perceived needs in evaluation differ from Iowa's minimum vocational instructor certification requirements?

Question 3. Do trade and industrial and technical instructors' perceived needs in evaluation differ from the perceived needs of the personnel development coordinators?

Question 4. Do trade and industrial and technical instructors' perceived needs in evaluation differ demographically?

Assumptions of the Study

1. University teacher education programs are the major source for professional teacher education of vocational instructors in the state of Iowa.
2. A sample consisting of 100 trade and industrial instructors chosen at random from Iowa's 15 Area schools is representative of the population.
3. Needed competencies in evaluation are best determined by sampling the perceived needs of instructors.
4. The content of vocational teacher education courses can best be determined by sampling the teacher educators responsible for teaching and developing the courses.
5. The minimum certification requirements for vocational-technical instructors specified by the Iowa Department of Public Instruction can best be determined by sampling the DPI personnel primarily responsible for certifying the instructors.

Limitations of the Study

The findings of this study will be limited to:

1. Generalizations for the state of Iowa.
2. Instructors employed for postsecondary trade and industrial and technical instruction in the 15 Area schools.

Procedure

1. Review of Literature. A review of literature was undertaken to identify current theories and research related to evaluation competencies and evaluation methods in vocational education.
2. Identification of Population. The population considered in this study was composed of four groups.
   a. All trade and industrial or technical instructors, with or without a baccalaureate degree, teaching in Iowa's 15 Area schools.
   b. All staff development coordinators or persons designated as having staff development coordination responsibilities employed by Iowa's 15 Area schools.
   c. All industrial vocational teacher educators teaching and/or developing courses in evaluation employed by Iowa State University and the University of Northern Iowa.
   d. The persons in charge of vocational-technical teacher certification employed by the Iowa Department of Public Instruction.

3. Development of Questionnaire. An instrument was developed using vocational instructor competencies in evaluation validated by Resnick (1977). Demographic data was requested to identify subgroups of instructors as well as to separate the subpopulations. The competencies were rated according to importance using a Likert scale.

4. Selection of Sample. The samples for this study were selected as follows:

   a. One hundred instructors were selected at random from the 15 Area schools.

   b. All industrial vocational teacher educators currently involved with teaching or developing evaluation courses.

   c. All staff development coordinators or those persons designated as such were included in this study.

   d. All of those persons dealing with vocational-technical teacher certification within the Iowa Department of Public Instruction.

5. Collection of Data. The data was collected from all of the subpopulations using the same instrument. The questionnaires were administered by mail or in person with follow-up letters to increase the percentage of returns.

6. Analysis of Data. The mean ratings of the following groups were calculated for each competency:

a. All trade and industrial and technical instructors

b. All industrial vocational teacher educators

c. All personnel development coordinators

d. All DPI personnel responsible for teacher certification

e. Trade and industrial and technical instructors without a B.S. degree

f. Vocational-technical instructors with less than four years vocational teaching experience

g. Vocational-technical instructors with more than four years vocational teaching experience

h. Vocational-technical instructors from each of the 15 Area schools.

A descriptive analysis was undertaken to show the relationship between the groups.

7. Dissemination of Results. The results have been reported in the form of a thesis.

Definition of Terms

1. Area vocational school - a vocational school established and operated by a merged area (Code of Iowa, 1977).
2. Merged area - an area where two or more county school systems or parts thereof merge resources to establish and operate a vocational school or a community college (Code of Iowa, 1977).

3. Vocational school - a publicly supported school which offers as its curriculum or part of its curriculum vocational or technical education, training, or retraining available to persons who have completed or left high school and are preparing to enter the labor market; persons who are attending high school who will benefit from such education or training but do not have the necessary facilities available in the local high schools; persons who have entered the labor market but are in need of upgrading or learning skills; and persons who due to academic, socioeconomic, or other handicaps are prevented from succeeding in regular vocational or technical education programs (Code of Iowa, 1977).
4. Criterion-referenced measurement - those measures which are used to ascertain an individual's status with respect to some criterion, i.e., performance standard (Popham and Husek, 1969, p. 2).
5. Educational evaluation - the determination of the worth of a thing. It includes obtaining information for use in judging the worth of a program, product, procedure or objective, or the potential utility of alternative approaches designed to attain specified objectives (Worthen and Sanders, 1973, p. 19).
6. Norm-referenced measurement - measures used to ascertain an individual's performance in relationship to the performance

of other individuals on the same measuring device (Popham and Husek, 1969, p. 2).

7. Program evaluation - the process of attributing differences between actual and comparative outcomes to program characteristics, under different conditions of student characteristics and other intervening influences, and making a judgment about the value of the program characteristics. The process is conducted for the purpose of making more rational decisions about programs (Moss, 1968, p. 5).
8. Vocational teacher education - includes those activities needed for assisting teachers or prospective teachers to secure the professional knowledge, abilities, understandings, and appreciations which will enable them to qualify for employment or advancement in vocational education (Roberts, 1965, p. 156).

CHAPTER II.

REVIEW OF RELATED LITERATURE

Determining what competencies are needed by teachers and what is the best approach to evaluate educational programs and students are problems that have received much attention in the literature. The purpose of this chapter was to review some of the theories and discussions of the following:

1. Evaluation theories
2. Vocational program evaluation
3. Measurement of student achievement
4. Competency-based teacher education.

Evaluation Theories

The word evaluation has taken on many different meanings. Defining evaluation is not a simple task. Worthen and Sanders (1973) recognized this problem when they stated:

> Evaluation is complex. It is not a simple matter of stating behavioral objectives, building a test, or analyzing some data, though it may include these. A thorough evaluation will contain elements of a dozen or more distinct activities. The mixture of activities in which a particular evaluator will be engaged will, of course, be influenced by resources of time, money, expertise, goodwill of schoolmen, or many other factors. But equally important (and more readily influenced) is the image that the evaluator holds of his specialty: its responsibilities, duties, uniqueness, and similarities to related endeavors (p. 17).

This section will consider the theoretical work of Cronbach (1963), Scriven (1967), Stufflebeam (1973), and Moss (1968).

Cronbach's theory

Cronbach's (1963) paper entitled "Course Improvement Through Evaluation" dealt with the concept of evaluation as more than measurement of student achievement. Cronbach defined evaluation broadly as "the collection and use of information to make decisions about an educational program" (p. 672). Cronbach conceptualized evaluation as much more than assigning scores to students using paper-and-pencil achievement tests, which seemed to have become the basic principle of evaluation. Three types of decisions delineated in the paper were: (1) course improvement, (2) decisions about individuals, and (3) administrative regulation.

To carry out this type of evaluation, several strategies should be used. First, the program should be evaluated during its development while it is still fluid, rather than merely comparing it with another program at the end. Secondly, evaluation should determine how a course brought about a change in a pupil, not merely that the change had taken place. Thirdly, evaluation should be designed to help identify areas where change could benefit the desired outcomes.

Cronbach viewed evaluation techniques as necessarily being broad and non-specific. Essay items, public opinion polls and open-ended questions would tend to allow unsuspected information which might be missed using instrumentation of a specific and objective nature.

Scriven's theory

Scriven's (1967) work was an extension of Cronbach's paper. Scriven agreed with Cronbach that evaluation must be carried out while a program is being developed. This role is called formative evaluation. However, evaluation of the finished curriculum should not be dismissed as unimportant. Scriven stated:

> In another role, the evaluation process may serve to enable administrators to decide whether the entire finished curriculum, refined by use of the evaluation process in its first role, represents a sufficiently significant advance on the available alternatives to justify the expense of adoption by a school system (pp. 41-42).

Scriven called this the summative role of evaluation. While Scriven's work was complex, it did serve to stimulate much thought by evaluation theorists.

CIPP model

The CIPP (context, input, process, and product) model was first proposed by Stufflebeam (1967) and later adopted by the Phi Delta Kappa National Study Committee on Evaluation (1971). A diagram of the model is given in Figure 1.

In an attempt at defining evaluation, Stufflebeam (1973) stated: "Evaluation is the process of delineating, obtaining, and providing useful information for judging decision alternatives" (p. 129). Stufflebeam went on to list several points to be regarded when considering the definition:

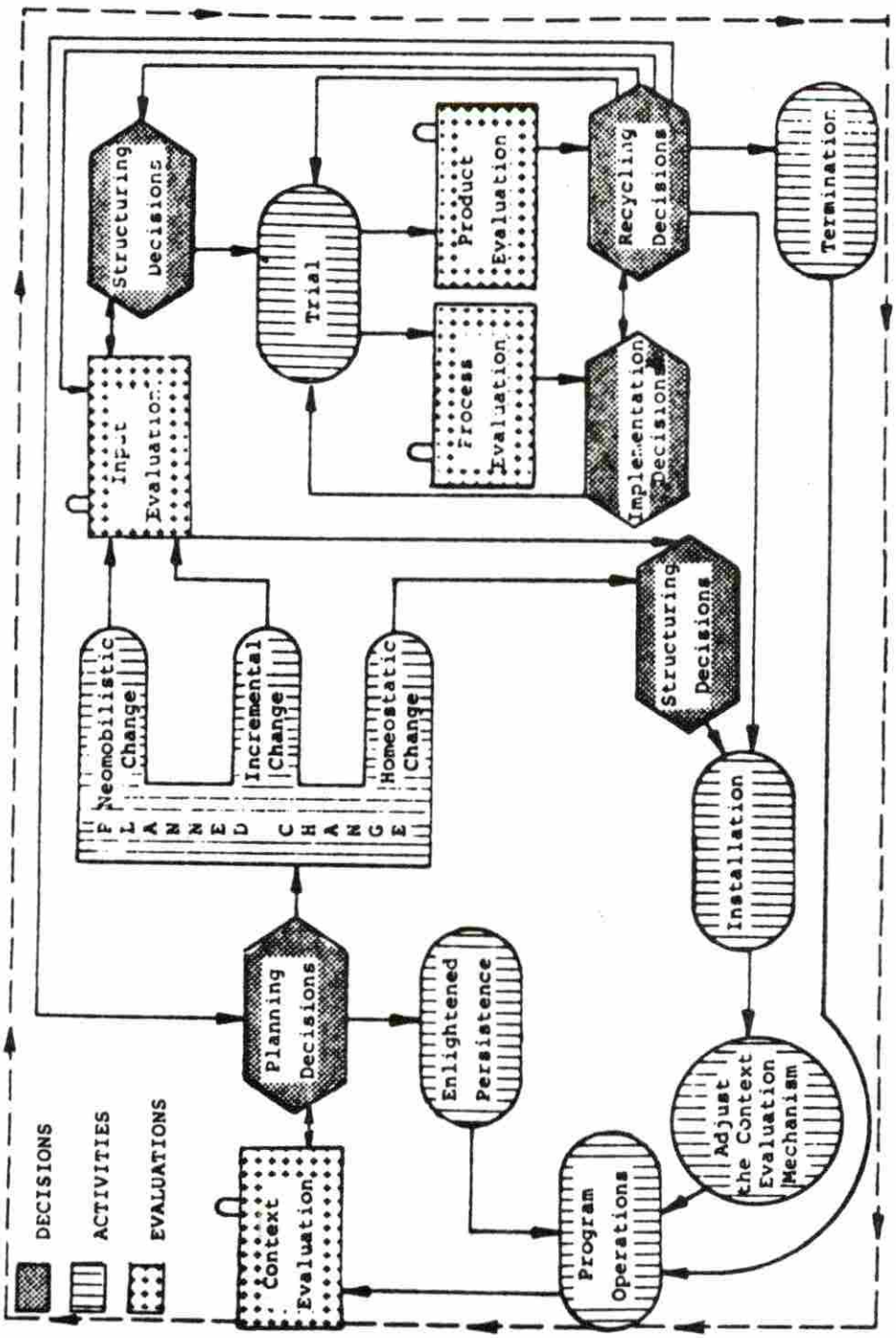

Figure 1. CIPP Evaluation Model

1. Evaluation is performed in the service of decision-making, hence, it should provide information which is useful to decision-makers.

2. Evaluation is a cyclic, continuing process and, therefore, must be implemented through a systematic program.

3. The evaluation process includes the three main steps of delineating, obtaining, and providing. These steps provide the basis for a methodology of evaluation.

4. The delineating and providing of steps in the evaluation process are interface activities requiring collaboration between evaluator and decision-maker, while the obtaining step is largely a technical activity which is executed mainly by the evaluator (pp. 129-130).

The four elements of the model were described as follows:

Context evaluation is the first and most basic kind of evaluation. Its purpose is to determine goals and objectives, identify needs and opportunities, and to diagnose related problems.

Input evaluation is concerned with how best to utilize available resources. Stufflebeam (1973) stated: "This is accomplished by identifying and assessing (1) relevant capabilities of the responsible agency, (2) strategies for achieving project objectives, and (3) designs for implementing a selected strategy" (p. 137).

Process evaluation has three objectives: (1) detect or predict defects in design or implementation of program, (2) provide information for programmed decisions, and (3) maintain procedural records.

> In summary, process evaluation provides project decision-makers with information needed for anticipating and overcoming procedural difficulties, for making preprogrammed decisions, and for interpreting project outcomes (p. 138).

Product evaluation is the measurement of attainments during the program as well as at the end. Stufflebeam (1973) stated:

> The general method of product evaluation includes devising operational definitions of objectives, measuring criteria associated with the objectives of the activity, comparing these measurements with predetermined absolute or relative standards, and making rational interpretations of the outcomes using the recorded context, input, and process information (p. 138).

Moss's theory

Moss (1968) developed an evaluation theory for vocational (occupational) education programs with much of the theory based on the works of Scriven and Stake. The theory outlined four major characteristics of program evaluation: (1) student characteristics, (2) program characteristics, (3) intervening influences, and (4) actual outcomes. Moss's model appears in Figure 2. Using these components, Moss defines program evaluation as:

> The process of attributing differences between actual and comparative outcomes to program characteristics, under different conditions of student characteristics and other intervening influences, and making a judgment about the value of the program characteristics. The process is conducted for the purpose of making more rational decisions about programs (p. 5).

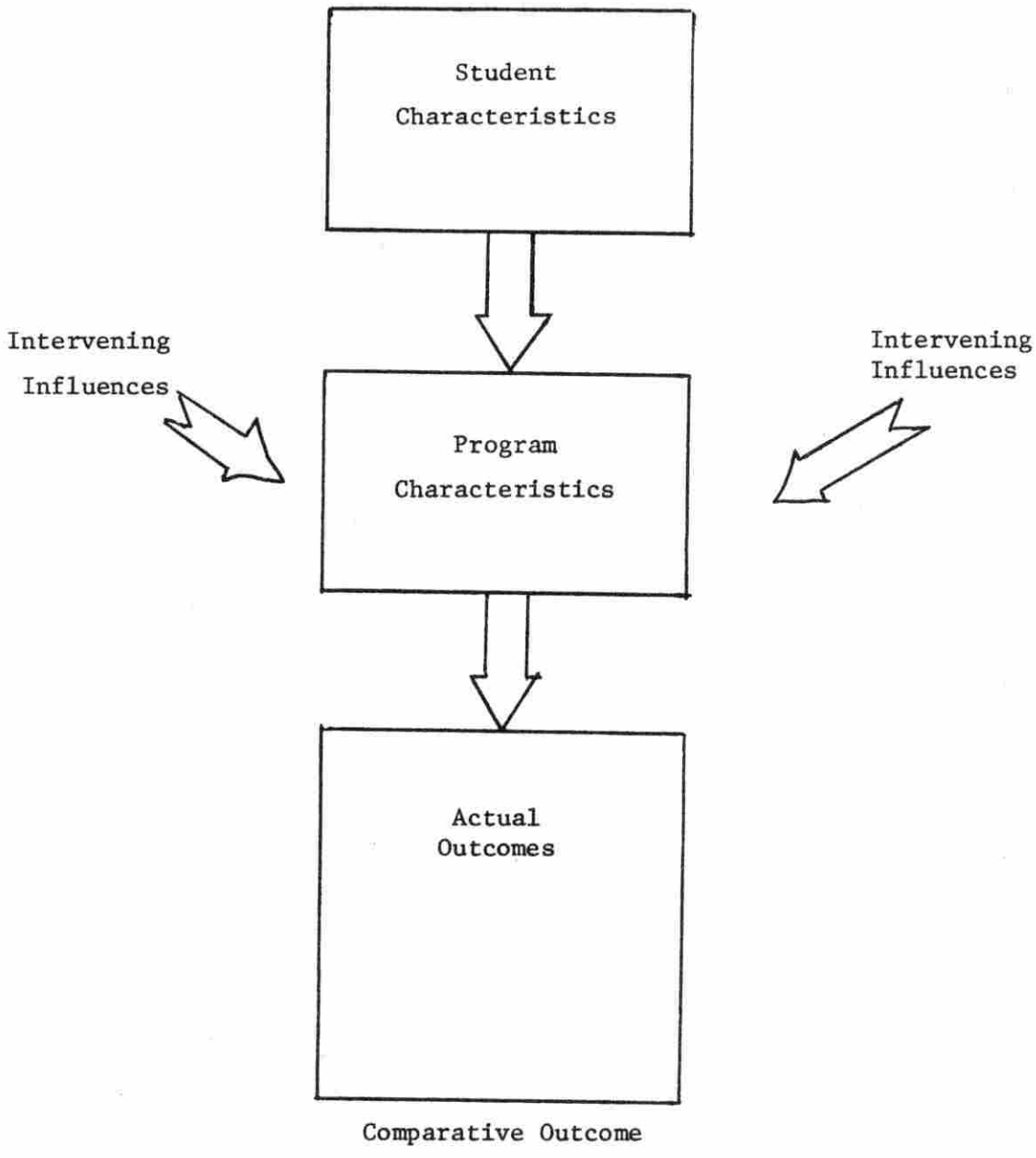

Figure 2. Moss's model

Vocational Program Evaluation

The theoretical models of vocational program evaluation are numerous. The methodologies and instrumentation used are also widely varied. This section will deal briefly with six general categories identified by Addison (1974):

1. Process evaluation
2. Product evaluation
3. Evaluation by objectives
4. Cost-benefit evaluation
5. Cost-effectiveness evaluation
6. Statewide systems evaluation (p. 37).

Process evaluation

Process evaluation deals with the quality of the ongoing program within the institution. The objects of this form of evaluation were identified by Patterson (1971):

> Process evaluation is focused on the program procedures, on the setting in which the program takes place, and especially on the behavior of the adults (teachers) who participate. The main questions asked concern the nature of materials and equipment, the plant and physical space, and adult (teacher) roles, especially whether adults (teachers) are functioning as intended (p. 809).

Process evaluations typically use rating scales or check lists to obtain data. The instruments are designed to be self-administered by the institution or by advisory committees.

Moss (1968) described a major problem with process evaluation:

> The criteria by which instructional programs are to be evaluated must be the outcomes--the products--of instruction. Program characteristics cannot be used as evaluative criteria, for, by so doing, we assume, rather than prove, that those characteristics are good (p. 6).

Moss went on to state that until research demonstrates that certain program characteristics make measurable changes in students, process evaluation will have limited validity.

Product evaluation

The major characteristic of product evaluation is that it centers around the graduated student. According to Addison (1974), the major question to be answered is "What actually happened to the students as a result of their having attended a certain vocational program or school" (p. 40).

Product evaluation is typically carried out through follow-up studies. Graduates are asked to complete an instrument asking for such data as income, employment history, type of employment and unemployment history. The studies are usually carried out several years after graduation.

The major drawback to product evaluation is the difficulty incurred in trying to control outside variables. Many things may be encountered by graduates which have an effect on their employment but in no way connected to their education.

Evaluation by objectives

Evaluation by objectives schemes are designed to measure the achievement of students as well as graduates; and comparisons are made between data obtained and specified objectives. Through the evaluation of students in ongoing programs, data is obtained which, in the form of feedback, could aid adjustments in ongoing strategies. Evaluation of graduates allows similar feedback, although at the completion of the course. Wickline (1971) gave a summary of evaluation by objectives:

> They (local education agencies) were subsequently asked to analyze and redesign their proposed treatments in order to move the students from where they were to where they could and should be. Of equal importance was the request that the agencies develop an evaluation design which would monitor the progress of the project and provide feedback information to the project director at regularly scheduled intervals to inform him of the progress being made toward achieving project objectives (p. 11).

The subjectivity of the determination of the objectives appears to be the most important shortcoming of evaluation by objectives.

Cost-benefit evaluation

This form of evaluation is concerned primarily with the monetary aspects of education. The cost factors to be considered are the cost of the program to taxpayers and earnings lost while the student is attending the program. The benefit factors are higher wages due to education and increased tax payments by the graduates. Costs were further broken down into such categories as cost of equipment, cost

of physical plant, and cost of instruction to facilitate the comparison of separate programs.

The major attribute of cost-benefit evaluation is that the data required is typically easy to obtain. According to Kraft (1974):

> It is relatively easy to obtain the input costs to education, the tax share, the bonds sold, and contributions from the public and industry. Also, there is little difficulty in determining the short-and-long-term financial returns to the student as a result of certain amounts and types of education (p. 55).

While the data required for cost-benefit evaluation is relatively easy to obtain, it is cautioned that valuable data may be overlooked. The personal and social outcomes of an educational program and the development of the affective domain are considerations which are not easily quantified in monetary terms.

Cost-effectiveness evaluation

Cost-effectiveness evaluation, while similar to cost-benefit evaluation, broadens the criteria for examination to include non-monetary benefits. Kraft (1974) described effectiveness as "an output, which cannot be evaluated in monetary or market value units as are many of the objectives in educational programs" (p. 57).

Cost-effectiveness takes one of two forms. The first form compares two programs with equal effectiveness, the less expensive program being considered superior. The second form holds dollar output constant, the more effective program being considered superior.

Cost-effectiveness evaluations are not prevalent at the local level. Kraft (1974) stated:

> Nearly all attempts to use cost-effectiveness analysis in education have been made on a national or regional basis. Usually specific programs such as vocational education or compensatory programs (Title I, in particular) have been the testing forums (p. 58).

The major drawback to using cost-effectiveness techniques at the local level is the complexity and resulting excessive cost. This form seems to be most applicable to research studies in education.

Statewide systems

The primary difference between statewide systems evaluation and the above mentioned systems is that the other evaluation forms are concerned primarily with local or national programs.

The following statement by Starr and Dieffenderfer (1972) described one system for statewide evaluation developed at the Ohio State University:

> An evaluation system is described whereby state divisions of vocational education, in cooperation with local school systems, can assess the effectiveness of their programmatic efforts. This system. . . provides management data which enable vocational education agencies more effectively to plan, monitor, and redirect their programmatic efforts in providing quality vocational education (p. xi).

The data to be collected by the system include: (1) program characteristics such as enrollment, quality and accessibility, (2) student status such as equal opportunity and special needs, and (3) follow-up information about educational outcomes.

States such as Illinois, New York, and California are using statewide systems evaluations. The advantages seem to be that federal mandates concerning accountability can readily be met using this system.

Measurement of Student Achievement

In recent years there has been extensive discussion concerning the need for criterion-referenced evaluation. Many experts feel that norm-referenced evaluation, presently in widespread use, is an adequate method of measuring educational outcomes. The discussion is typically of the all or none variety; one should be used exclusively over the other. The purpose of this section was to relate some of the current differences among measurement theorists concerning norm-referenced and criterion-referenced measurement.

Norm-referenced measurement

Norm-referenced measurement has been the cornerstone of educational evaluation for many years. Hambleton and Novick (1973) described norm-referenced evaluation as "the fixed quota selection or ranking of individuals on an ability continuum" (p. 162). A similar definition was proposed by Greco (1974) when he stated, "Norm-referenced measures tell that one student is more or less proficient than another" (p. 23). Norm-referenced evaluation is, therefore, the measurement of an individual's ability to perform on an evaluation instrument. The performance is compared to some specified group for the purpose of ranking the individual within the group. Quite often, when the terms

norm-referenced measurement and norm-referenced tests were used, they were designating standardized instruments such as the Iowa Tests of Basic Skills, the Iowa Tests of Educational Development or the Scholastic Aptitude Test.

Several factors must be considered when analyzing norm-referenced instruments: validity, reliability, discrimination, difficulty, and the use of scores.

Validity Ebel (1972) defined test validity when he stated: "The term validity means the accuracy with which a set of test scores measures what it ought to measure" (p. 435). For this reason, each item must be carefully written so as to insure its value in measuring stated abilities. Care must also be taken to insure that all abilities are adequately represented by test items.

Reliability Gronlund (1976) described reliability by stating "reliability refers to the consistency of evaluation results" (p. 80). Reliability and validity are related as was stated by Erickson and Wentling (1976):

> Reliabilty is the first requisite of validity. It places some very definite restrictions on validity. . . .Instruments that provide accurate measures of what they are designed to measure must, by definition, provide consistent or reliable measures. However, the inverse is not necessarily true (p. 37).

Discrimination Item discrimination is closely related to the need for response variance in norm-referenced tests. Sax (1974) stated, "Discrimination indices measure the extent to which items are capable of measuring individual differences" (p. 235). When making

comparisons among individuals within a group, each question must be answered correctly by some students and incorrectly by others. If all students were to perform equally well on an item, it would have no discrimination. Ideally, all of the upper level students would answer the item correctly while the lower level students would answer it incorrectly.

Difficulty The higher the proportion of students correctly answering an item, the less difficulty it has. Difficulty is closely related to discrimination. Sax (1974) noted this when he stated, "An item that is extremely hard or easy cannot effectively discriminate among students" (p. 239). An optimum level of difficulty does not guarantee discrimination. Sax continued, "High discrimination indices require some optimal level of difficulty, but optimal difficulty levels do not assure high discrimination indices" (p. 239).

Use of scores Two of the most commonly used scores are the percentile and standard score. The percentile score states that a student's performance on a test is better than a certain percentage of the group taking the test. The standard score relates an individual performance to a normal curve distribution of scores.

Criterion-referenced measurement

In the past 15 years, research dealing with criterion-referenced measurement in education has gained popularity. The research called for increased use of criterion-referenced measurement in educational programs.

There were numerous definitions of criterion-referenced measurement and tests. Glaser and Nitko (1971) defined criterion-referenced measurement as "measurements that are directly interpretable in terms of specified performance standards" (p. 653). Haladyna defined a criterion-referenced test as "one which is designed to assess the degree to which any student has mastered a set of instructional objectives" (p. 93). The most important characteristic of criterion-referenced measurement was that it related to performance (behavioral) objectives. A performance objective is a statement describing what a learner will know or be able to do following completion of an educational activity. A set of performance objectives is a pre-determined listing of the competencies a student should have if he/she successfully completes the course for which the objectives were intended.

As with norm-referenced instruments, validity, reliability, discrimination, difficulty, and the use of scores must be considered when discussing criterion-referenced instruments.

Validity Content validity is determined by carefully judging the apparent relevance of the test to the criterion defined in the objectives. If the performance objectives are valid indicators of what a student should know, and the test items measure this knowledge, the test will be valid.

Reliability The purpose of a criterion-referenced test is to classify examinees into mastery states, typically masters

and non-masters. To be reliable, an instrument must consistently classify individuals into mastery states. If a test is measuring the mastery of more than one objective, it is possible for the items assessing one objective to be reliable while the other items are not. Swaminathan et al. (1974) stated:

> Specifically, we define reliability of a criterion-referenced test as the measure of agreement between the decisions made in repeated test administrations. Let us stress that if the test consists of items measuring several objectives, then it is necessary to determine the reliability for each subtest measuring a particular objective (p. 264).

Discrimination and difficulty These characteristics, as they are traditionally conceived, do not apply to criterion-referenced tests. Discrimination and difficulty are directly related to item variance which Millman and Popham (1974) felt were unnecessary characteristics of traditionally conceived criterion-referenced tests. The ranking of individuals is not important, thus item or score variance is unimportant, except that the test must discriminate between masters and non-masters.

Use of scores The interpretation of the results of a criterion-referenced test is very direct. The evaluator is trying to determine mastery from non-mastery. Mastery is prescribed in the performance objectives and a comparison yields the needed data.

A comparison

The most evident and basic conceptual difference between the two forms of evaluation was the entity to which the learner

is referenced. As has already been stated, in norm-referenced measurement the individual student is compared to and ranked within a group of learners. In criterion-referenced measurement, individual performance is compared to a specified set of competencies. It might also be stated as the difference between what a student knows in relation to other students and what a student knows in relation to what has been specified that he should know.

Validity, as it related to the two forms of measurement, remained constant. The only distinction made between the two forms of measurement was that the term domain selection validity was unique to criterion-referenced measurement. Popham (1975) described domain selection validity by stating, "Domain selection validity indicates that if the domains of learner behaviors are improperly selected, they can be said to be invalid in the test" (p. 132).

As with validity, the term reliability had basically the same meaning for either test. The only distinction made was that a criterion-referenced test may have more than one reliability and that norm-referenced tests must consistently rank individuals while criterion-referenced tests must consistently determine mastery states.

Differences became apparent with discrimination. Much of the theoretical differences related to item variance. For a norm-referenced test item to discriminate among individuals, some must answer the item correctly while others must miss it. This can give rise to a rather serious problem. Suppose that most of the examinees answer an item correctly. And further suppose the item represents a concept held

as very important by a teacher. Even though most of the students may well have mastered the concept, it must be discarded in that it does not discriminate. If it is retained in the test, it will have little bearing on the final outcome of the scores. It will become a meaningless item even though it may assess knowledge of an important concept.

Several types of scores are related to norm-referenced tests. Most have norm-referenced meaning although the raw score does not. The raw score states the number of correct responses on an instrument. While not precise, this score does have criterion-referenced meaning in that it gives an indication of what the student knew in relation to the competencies tested.

It was also argued that a criterion-referenced score had norm-referenced meaning. When the terms master and non-master (non-master meaning a student who has not mastered a specific objective and needs remedial help) are used, a critical score or cut-off point must be assumed. Millman (1973) suggested a method of establishing this critical score:

> When establishing standards for criterion-referenced measurements, one procedure which has a degree of rationality is to set the passing score so that a predetermined percent of students pass. Whether an individual passes under this scheme depends, in part, on the general competence of others taking the test. This procedure is most applicable when the number of people who can or should be given some treatment or certification is fixed and the assessment task it to select the ablest examinees (p. 206).

If the number of students to reach mastery must be fixed or determined by a certain percentage, a comparison must be made so that the fixed number may be drawn from the highest ranking students. This has norm-referenced meaning.

Greco concluded his (1974) article by stating:

> It appears that the recent literature relating to criterion-referenced tests has little relevance for the individual teacher. Perhaps the most useful outcome of this flurry of activity relating to criterion-referenced tests has been the re-examination of the relevant considerations involved in test construction, particularly in reference to tests designed for the special purposes of diagnosing deficiencies of students' skills and for evaluating instructional programs (p. 25).

Competency-Based Teacher Education

The competency-based teacher education movement has gained popularity in the past few years. It has, through its development, also come to mean many different things to many different people. This section includes a discussion of some of the current definitions and descriptions and addresses the literature relative to competency-based vocational teacher education.

Definitions and descriptions

There were many different interpretations of the meaning of competency-based teacher education in the literature during the early years of the movement. Weber (1973) gave a general meaning by stating:

> The term competency-based teacher education. . . tends to focus attention on the specification and assessment of consequence competencies as well as cognitive and performance competencies (p. 6).

Ward and Jung (1968) described competency-based teacher education when they predicted what teacher education must become:

> A viable teacher education program will center around pre-defined performance objectives that lead to the competencies teachers need to function effectively in their emerging roles. This includes performance in relation to subject matter objectives, teacher strategy objectives, professional identity objectives, and personal and interpersonal objectives (p. 312).

Recently, Lindsey (1976) provided a lengthy but seemingly complete definition of competency-based teacher education:

> Competency-based teacher education is an approach to curriculum designing that is systematic, process oriented (and) situationally based. That is, CBTE requires that we define knowledge, skills, and attitudes; design strategies for achieving goals, evaluate achievement (and) feed results into the system for continuous improvement. The essential characteristics may be stated as follows: Competencies are derived from conceptions of teacher roles in achieving school goals: supported by research, curriculum, and job analysis, teacher judgment: stated so as to make assessment possible in terms of competence made public in advance (pp. 509-510).

The definitions and descriptions place emphasis on the development of cognitive, psychomotor and affective competencies. Competency-based teacher education relies on the specification of levels of competence in these domains.

Competency-based vocational teacher education

Vocational teacher education has become an increasingly complex task. Several variables which give rise to the complexity were identified by Lovelace (1975) as:

> The existence of separate and distinct teacher education procedures for each vocational education program area, the emergence of a distinction between teacher education procedures for secondary and postsecondary vocational teachers, and the extensive recruitment of vocational teachers from occupations rather than from preservice programs with the resultant need for inservice activities (p. 4).

The competency-based movement in vocational education is concerned primarily with professional or pedagogical skills. Most vocational instructors are recruited from the occupational ranks and work experience is used to assess competence in occupational skills. For this reason, the greatest emphasis for curricula, designed to prepare and improve vocational instructors, is in professional education.

The methodology most often used to determine these competencies is the occupational analysis technique or task analysis. According to Lovelace (1975)

> As a result of a need for a systematic foundation for the development of competency-based teacher education curriculum, credence has been granted to the extended use of the occupational analysis technique (p. 3).

A study by Cotrell et al. (1971), which followed the occupational analysis technique, is generally recognized as the most comprehensive

study of competencies for vocational teachers. The study identified 390 performance elements which were clustered in 10 different categories. Those categories were:

1. Program planning, development, and evaluation
2. Instruction-planning
3. Instruction-execution
4. Instruction-evaluation
5. Management
6. Guidance
7. School-community relations
8. Student vocational organizations
9. Professional role and development
10. Coordination.

The 10 categories were further studied to determine the relevance of each to cooperative education programs and in-school secondary and postsecondary programs. The study concluded that vocational teacher education could be divided into three options: in-school preparation, cooperative education and a combination of both.

CHAPTER III.

PROCEDURE

This chapter describes the design and implementation of the research methods of this study. The chapter consists of four parts: (1) the instrument, (2) the sampling plan, (3) administration of the instrument, and (4) analysis of the data.

The Instrument

The first step in this study was to develop an instrument that would assess the perceived evaluation needs of the population. This section was divided according to the subheadings (1) selection of competencies and (2) design of the instrument.

Selection of competencies

It was determined that an instrument used to assess instructor's needs in evaluation should be developed using a representative sample of instructor competencies. Three studies of vocational-technical instructor competencies were reviewed. A study by Halfin and Courtney (1971) listed 130 competencies which were determined as needed by secondary vocational instructors. The Halfin and Courtney study was not used since it was not directed at competencies required by postsecondary vocational instructors.

A second study by Cotrell et al. (1972) listed 384 competencies needed by vocational instructors. This study was regarded as the

most comprehensive listing of vocational teacher competencies. An attempt was made to determine if the Cotrell competencies had been recently validated. A third study by Resnick and Carmody (1977) validated competencies for vocational instructors, middle managers, and administrators. A synthesized list of 194 vocational instructor competencies was developed primarily from the Cotrell study.

The Cotrell study listed 26 competencies for the evaluation of instruction. The Resnick study synthesized the original 26 competencies into 18 competencies before the validation was undertaken. Both lists of competencies dealing with evaluation appear in Appendix A.

In the Resnick study the validation process was carried out using a modified Delphi technique. Groups of vocational teachers were asked to vote on each competency as to the competency's importance. After three rounds of voting, either consensus had been reached with the competency being important or unimportant, or no consensus was reached. The competencies that were determined as important were voted on again to reach consensus as to which of 10 categories each competency belonged.

Design of the instrument

The instrument used consisted of two parts (see Appendix C).

The first part of the instrument related to demographic data. The respondents were asked to identify the subpopulation to which they belonged. The instructors were asked to identify the following:

(1) years of vocational teaching experience, (2) degree held, (3) service area taught, (4) professional courses completed, and (5) Area school.

The second part of the instrument dealt with assessing the needs of the instructors. The 18 validated competencies specified by Resnick et al. (1977) were listed with a rating scale used to determine relative need. The Likert scale was employed with a range of 1 to 5, the 1 signifying that the respondent needed no proficiency in the activity and 5 indicating that complete proficiency was needed. Competencies 1 and 17 were subdivided into components because of the broad scope of the competencies. Competency 1 was broken into two parts and competency 17 was broken into three parts. This yielded 21 ratings from the original 18 competencies or subcompetencies.

A copy of the instrument was submitted to three individuals to determine the content validity. A list of those individuals appear in Appendix D. Changes were recommended and based on these recommendations, two changes were made. Item four in the demographic data section was clarified by adding examples after the service areas, and the instrument was printed on green paper in an attempt to increase returns. A cover letter from the department was added to the completed instrument (see Appendix E).

The Sampling Plan

The second step in this study was the determination of the sample. The sample was selected from the four subpopulations:

1. Iowa's postsecondary trade and industrial and technical instructors.
2. Industrial teacher educators at Iowa State University and the University of Northern Iowa.
3. The Iowa Department of Public Instruction vocational teacher certification personnel.
4. Personnel Development Coordinators or those individuals designated as such in the 15 Area schools.

Vocational instructors

A list was obtained from the Iowa Department of Public Instruction (1977) containing the names of all postsecondary trade and industrial and technical instructors in the State of Iowa. The instructors were listed by Area school and by program. A total of 397 names were identified. Using a table of random numbers, 100 instructors or approximately 25 percent of the population were chosen at random from the total population. The random sampling yielded representation from all of the 15 Area schools. Table 1 shows the number of instructors representing each Area school and the total number of trade and industrial and technical instructors in each school.

Table 1. Number of trade and industrial and technical instructors in each Area school and number of instructors from each Area school in sample

Area	I	II	III	IV	V	VI	VII	IX	X	XI	XII	XIII	XIV	XV	XVI
Instr. in school	21	16	8	27	16	7	54	36	35	46	37	30	13	38	13
Instr. in sample	5	1	1	7	4	2	15	10	9	14	12	8	1	9	2

Teacher educators

The Department of Industrial Education at Iowa State University and the Department of Industrial Technology at the University of Northern Iowa were contacted to determine the industrial vocational teacher educators teaching an evaluation course or directly involved in developing such a course. Five industrial vocational teacher educators, one from UNI and four from ISU, met the requirements. These individuals made up the subpopulation and the sample.

Iowa Department of Public Instruction

The Area Schools and Career Education Branch of the Iowa Department of Public Instruction was contacted to determine the individual(s) responsible for vocational teacher certification. It was determined that the consultant for career teacher education of the Teacher Certification Division had sole responsibility for vocational teacher certification. He made up the subpopulation and the sample.

Personnel development coordinators

The coordinator of Industrial Vocational Technical Teacher Education in the Department of Industrial Education at Iowa State University was contacted for a list of the 15 Personnel Development coordinators or those individuals so designated at the 15 Area schools. The total subpopulation was involved in this study.

Administration of the Instrument

The third step in this study was to administer the instrument and collect the data. Table 2 represents the number of instruments administered to each subpopulation and the number of instruments returned by each group.

Vocational instructors and personnel development coordinators

The instrument was administered to the subjects of these subpopulations by mail. Mailing labels and personalized cover letters were computer printed for each subject. The letters were attached to instruments and mailed to each individual with a stamped and addressed return envelope. Each instrument was coded to identify the source of returns. Copies of the letters sent to instructors and personnel development coordinators appear in Appendix B. The instruments were mailed on January 10, 1978.

A follow-up mailing was made on January 20, 1978 to 45 instructors who had failed to respond by that date. The follow-up mailing consisted of another instrument, a personalized computer printed letter (see Appendix B) and an addressed return envelope.

Of the 15 personnel development coordinators who received instruments, 14 responded yielding a return rate of 93 percent. A total of 79 of the 100 instructors responded. Two instruments were not useable thus yielding a useable return of 77 percent for this subpopulation.

Table 2. Number in sample for each subpopulation and number returning the instrument

Subpopulation	Sample	Respondents
1. Instructors	100	79
2. Teacher educators	5	5
3. D.P.I.	1	1
4. P.D. coordinators	15	14

Department of Public Instruction

The individual specificied in this sample was contacted by phone and asked to participate in the research. Upon agreeing to participate, the individual was instructed to rate each item according to the importance of the competency relative to certification requirements. An instrument and a return envelope were mailed to the individual. The instrument was returned, yielding a return of 100 percent for this subpopulation.

Vocational teacher educators

The teacher educators at Iowa State University were contacted in person and asked to participate in the study. All four teacher educators agreed to participate and were given a copy of the instrument. Each participant was asked to rate the competencies according to the relative importance of each competency in relation to the objectives of the evaluation course taught. The industrial vocational teacher educator from the University of Northern Iowa was contacted by phone

and an instrument was mailed to him with a return envelope. The instructions given to this teacher educator relative to the criteria for completing the instrument were identical to the instructions given the other teacher educators. All of the teacher educators responded to the instrument, yielding a return of 100 percent.

Analysis of Data

The final step in the study was to analyze the data to determine if differences existed between any of the subpopulations. This section discusses: (1) the calculation of mean ratings and (2) the Mann-Whitney U-Test.

Calculation of means

The data obtained from the instruments were in the form ratings on a 1 through 5 Likert scale. Each instrument yielded 21 ratings. The data was coded onto forms according to the following groups: (1) trade and industrial and technical instructors, (2) industrial vocational teacher educators, (3) personnel development coordinators, (4) the Iowa Department of Public Instruction, (5) trade and industrial and technical instructors with more than four years experience, (6) trade and industrial and technical instructors with less than four years experience, (7) trade and industrial instructors, (8) technical instructors, (9) instructors with a bachelor's degree in education, (10) instructors with a bachelor's degree not in education, (11) instructors with bachelor's degrees, (12) instructors without bachelor's degrees, (13) instructors

who had completed a course in evaluation, and (14) instructors who had not completed a course in evaluation.

The mean ratings for each of the competencies was calculated for each group. These mean ratings were then rank ordered yielding a rank ordering of the competencies within each group. The ranking of the competencies for each subpopulation appear in Appendix E.

Mann-Whitney U-Test

A statistical test was needed that would test for differences between two groups. The Mann-Whitney U-Test was chosen because the following two assumptions are required prior to its use: (1) ordinal data and (2) independent measures within two groups.

The research questions were answered by testing eight combinations of two groups with 21 mean ratings per group. Since each group contained more than 20 ratings, the ratings were assumed to be normally distributed. The confidence interval chosen to determine significance in this study was the .05 level of significance.

Following are the comparisons made in the process of answering the research questions of this study.

Question 1. Do trade and industrial and technical instructors' perceived needs in evaluation differ from the content of vocational teacher education courses? The trade and industrial and technical instructors' mean ratings of the competencies were compared to the industrial vocational teacher educators' mean ratings.

Question 2. Do trade and industrial and technical instructors' perceived needs in evaluation differ from Iowa's minimum vocational teacher certification requirements? The trade and industrial and technical instructors' mean ratings of the competencies were compared to the ratings obtained from the Iowa Department of Public Instruction.

Question 3. Do trade and industrial and technical instructors' perceived needs in evaluation differ from the perceived needs of the personnel development coordinators? The mean ratings of the instructors were compared to the mean ratings of the personnel development coordinators.

Question 4. Do trade and industrial and technical instructors' perceived needs in evaluation differ demographically? The comparisons made were: (1) instructors with more than four years of vocational teaching experience and instructors with less than four years vocational teaching experience, (2) instructors with a bachelor's degree and instructors without a bachelor's degree, (3) instructors with a bachelor's degree in education and instructors with a bachelor's degree not in education, (4) trade and industrial instructors and technical instructors, and (5) instructors who had completed a professional course in evaluation and instructors who had not completed a professional course in evaluation.

CHAPTER IV.

FINDINGS

This chapter will review the findings of this study according to the following sections: (1) demography, (2) ranking of competencies by instructors and (3) questions of the study. Supplementary materials relating to this chapter may be found in Appendices E and F.

Demography

The first part of the instrument dealt with demographic information. The number of respondents in the four subpopulations are as follows: (1) 77 instructors, (2) five teacher educators, (3) 14 personnel development coordinators, and (4) one instrument was received from the D.P.I. The demographic breakdown of the instructors is contained in Table 3. The numbers of instructors responding in each of the demographic categories are as follows: (1) there were 24 instructors with less than four years of vocational teaching experience and 53 instructors with more than four years experience; (2) there were 19 instructors with a baccalaureate degree in education and 12 instructors with a baccalaureate degree not in education; (3) there were 31 instructors with a baccalaureate degree and 46 instructors with no degree; (4) there were 26 technical instructors and 51 trade and industrial instructors; and (5) there were 24 instructors who had not completed a professional course in evaluation and 53 who had completed such a course. The rankings and mean ratings of the competencies by each group appear in Appendix E.

Table 3. Numbers of instructors in each demographic subgroup

Subgroup	Number[a]
Less than four years experience	24
More than four years experience	53
Baccalaureate degree in education	19
Baccalaureate degree not in education	12
Baccalaureate degree	31
No degree	46
Technical instructors	26
Trade and industrial instructors	51
Completed professional course	24
No professional course	53

[a]Each instructor falls in more than one category.

Ranking of Competencies by Instructors

The 21 competencies or subcompetencies follow in the order of need perceived by the instructors. The instructors felt on the average that they needed the most proficiency in the first competency listed and the least proficiency in the last competency or subcompetency. An asterisk beside two competencies or subcompetencies indicates a tied rank.

1. Establish criteria for evaluating student performance based upon classroom instruction and laboratory (or on-the-job) experience.
2. Develop a system for measuring laboratory performance that includes an assessment of student progress, laboratory

performance tests, laboratory performance rating sheets, and assessment of student-made products.

*3. Evaluate the entire instructional program. Measure student progress against the student performance objective.

*4. Develop an instrument to evaluate the students' work, work attitudes, qualities, personal traits and progress on the job.

5. Adjust plans and strategies based on observed feedback from students.

6. Develop a system for measuring student progress that will incorporate cognitive, affective, and psychomotor objectives.

7. Appraise student products according to occupational performance standards.

8. Develop cognitive tests related to the instructional objectives. Use essay type, true/false, completion, matching, and multiple choice items.

9. Evaluate individual assignments completed through directed study against student performance objectives.

10. Develop a system for self-evaluation of the instructional process.

11. Formulate a grading system consistent with school policy.

12. Develop a system for analyzing test results to measure both student progress and the validity and reliability of the test.

13. Assess student progress and/or achievement, and involve the students in the evaluation process.

14. Appraise student products in relation to student performance objectives.
15. Arrange for students to evaluate their own progress and devise self-evaluation techniques for them to use.
16. Develop case study situations to test student problem solving ability.
17. Work with students to cooperatively evaluate student performance against criterion measures.
18. Consider the cumulative data regarding student ability and past achievement in evaluating current performance.
19. Obtain information from fellow teachers and supervisory personnel.
20. Develop a system for testing students orally, using both teacher-made items and commercially availably products.
21. Locate and utilize available standardized tests to measure achievement.

Questions of the Study

Question 1

Do trade and industrial and technical instructors' perceived needs in evaluation differ from the content of vocational teacher education courses?

In answering this question a comparison was made between the mean ratings of the competencies assessed by the instructors and the vocational teacher educators. The Mann-Whitney U-Test was used to accomplish

this comparison as well as subsequent comparisons in this chapter. The mean ratings by the instructors ranged from 3.87 to 2.52 and the teacher educators mean ratings ranged from 4.8 to 2.8, where 1 is no proficiency and 5 is complete proficiency. The complete listings of ratings appear in Appendix E.

The ratings for both groups were ranked together and the sum of the ranks of cases was calculated for each group. The sum of the ranks of cases for the instructors was 288 and the sum of the ranks for teacher educators was 615. The z-observed (see Appendix G) was 4.11 which indicates that a significant difference exists between the populations of ratings at the .01 level of significance. A summary of the Mann-Whitney U-Test is presented in Table 4.

Table 4. Comparison of competency ratings of instructors and teacher educators

Subpopulation	Range[a]	Sum of ranks	z-observed[b]
Instructors	3.87 - 2.52	288	
Teacher educators	4.8 - 2.8	615	4.11**

[a] 1 is no proficiency needed and 5 is complete proficiency needed.

[b] z-critical at .05 = 1.96.

**Significant at P<.01.

Question 2

Do trade and industrial and technical instructors' perceived needs in evaluation differ from Iowa's minimum vocational teacher certification requirements?

The second question was answered by comparing the instructors' mean ratings of the competencies with the ratings obtained from the Iowa Department of Public Instruction. The instructors' mean ratings ranged from 3.87 to 2.52; the ratings from the Department of Public Instruction ranged from 5 to 2. The complete listings of ratings appear in Appendix E.

The sum of the ranks of cases calculated for the instructors was 404 while the sum of the ranks for the Department of Public Instruction was 499. The z-observed was 1.19 which indicated that there is no significant difference between the two populations of ratings at the .05 level of significance. These data appear in Table 5.

Table 5. Comparison of competency ratings of instructors and the Iowa Department of Public Instruction

Subpopulation	Range[a]	Sum of ranks	z-observed[b]
Instructors	3.87 - 2.52	404	
D.P.I.	5 - 2	499	1.19

[a] 1 is no proficiency needed and 5 is complete proficiency needed.

[b] z-critical at .05 - 1.96.

Question 3

Do trade and industrial and technical instructors' perceived needs in evaluation differ from the perceived needs of the personnel development coordinators?

The answer to this question was determined by comparing the mean ratings given by the personnel development coordinators. The range of the mean ratings for instructors was 3.87 to 2.52. The range of the mean ratings for the personnel development coordinators was 4.64 to 2.64. The complete lists of ratings for these subpopulations appear in Appendix E. The sum of the ranks of cases for the instructors was 372 and the sum of the ranks of cases for the personnel development coordinators was 531. The comparison yielded a z-observed of 2.00 which indicated a significant difference between the populations of ratings at the .05 level of significance. These results appear in Table 6.

Table 6. Comparison of competency ratings of instructors and the personnel development coordinators

Subpopulation	Range[a]	Sum of ranks	z-observed[b]
Instructors	3.87 - 2.52	372	
Coordinators	4.64 - 2.64	531	2.00*

[a] 1 is no proficiency needed and 5 is complete proficiency needed.

[b] z-critical at .05 = 1.96.

*Significant at P<.05.

Question 4

Do trade and industrial and technical instructors' perceived needs in evaluation differ demographically?

The data analysis for this question is presented under the following headings: (1) vocational teaching experience, (2) college degree held, (3) service area, and (4) professional evaluation course.

Vocational teaching experience A comparison was made between instructors with more than four years vocational teaching experience and instructors with less than four years vocational teaching experience. Results of this comparison appear in Table 7. Instructors with less than four years experience rated the competencies from an average of 3.5 to an average of 2.54. Instructors with more than four years experience rated the competencies from an average of 4.03 to an average of 2.51. The ranks and mean ratings of all of the competencies for both groups appear in Appendix E. The sum of the ranks of cases of the mean ratings by instructors with less than four years experience was 279. The sum of the ranks of cases of the mean ratings by instructors with more than four years experience was 624. The comparison yielded a z-observed of 4.34 which indicated a significant difference between the populations of ratings at the .01 level of significance.

College degree held Two comparisons were made concerning college degrees. The first comparison was made between instructors with a baccalaureate degree in education and instructors with a baccalaureate degree in education. Table 8 contains the results of this comparison.

Table 7. Comparison of instructors according to vocational teaching experience

Subpopulation	Range[a]	Sum of ranks	z-observed[b]
Instructors with less than four years experience	3.5 - 2.54	279	
Instructors with more than four years experience	4.03 - 2.51	624	4.34**

[a]1 is no proficiency needed and 5 is complete proficiency needed.

[b]z-critical at .05 - 1.96.

**Significant at P<.01.

Table 8. Comparison of instructors according to type of degree

Subgroup	Range[a]	Sum of ranks	z-observed[b]
With education degree	4.21 - 2.21	577.5	
With non-education degree	4.08 - 2.83	325.5	3.17**

[a]1 is no proficiency needed and 5 is complete proficiency needed.

[b]z-critical at .05 = 1.96.

** Significant at P<.01.

The second comparison was made between instructors with a baccalaureate degree and instructors with no degree. The results of this comparison appear in Table 9. Complete lists of the ranks and mean ratings of all competencies for all subgroups appear in Appendix E.

Table 9. Comparison of degreed and non-degreed instructors

Subgroup	Range[a]	Sum of ranks	z-observed[b]
Degree	4.16 - 2.45	590.5	
No degree	3.89 - 2.56	312.5	3.50**

[a]1 is no proficiency needed and 5 is complete proficiency needed.

[b]z-critical at .05 level = 1.96.

**Significant at P<.01.

In the first comparison, the range of mean ratings for instructors with a degree in education was 4.21 to 2.21. Instructors with a degree not in education gave mean ratings ranging from 4.08 to 2.83. The sum of ranks of cases for instructors with an education degree was 577.75. Instructors with a non-education degree had a sum of the ranks of cases of 325.5. The z-observed calculated for this comparison was 3.17 which indicates a significant difference between the populations of ratings at the .01 level of significance.

The second comparison between degreed and non-degreed instructors was based on mean ratings with ranges of 4.16 to 2.45 and 3.89 to 2.56, respectively. The sum of the ranks of cases for instructors with a degree was 590.5 and 312.5 for instructors without a degree. This comparison yielded a z-observed of 3.50; thus a significant difference exists between the populations of ratings at the .01 level of significance.

Service area A comparison between technical instructors and trade and industrial instructors yielded data which appear in Table 10. Lists of ratings and rankings by each subgroup of the competencies appear in Appendix E. The technical instructors' mean ratings ranged from 3.80 to 2.35. The sum of the ranks of cases for technical instructors was 491 and the sum of the ranks of cases for trade and industrial instructors was 412. The calculated z-observed was 0.99. No significant difference exists between the populations of ratings.

Table 10. Comparison of instructors according to service area

Subgroup	Range[a]	Sum of ranks	z-observed[b]
Technical instructors	4.00 - 2.69	491	
Trade and industrial instructors	3.80 - 2.35	412	0.99

[a]1 is no proficiency needed and 5 is complete proficiency needed.

[b]z-critical at .05 level = 1.96.

Professional evaluation course Table 11 presents the data obtained from the comparison of instructors who had completed a professional course in evaluation and instructors who had not completed a course in evaluation. Instructors who had completed such a course gave average ratings with a range of 4 to 2.56, and a sum of the ranks of cases of 539.5. Instructors who had not completed a professional course in evaluation gave average ratings ranging from 3.58 to 2.46, and a sum of the ranks of cases of 363.5. The z-observed of this comparison was 2.21 indicating a significant difference between the populations of ratings at the .05 level of significance.

Table 11. Comparison of instructors who had and had not completed a professional course in evaluation

Subgroup	Range[a]	Sum of ranks	z-observed[b]
Course completed	4.00 - 2.56	539.5	
Course not completed	3.58 - 2.46	363.5	2.21*

[a]1 is no proficiency needed and 5 is complete proficiency needed.

[b]z-critical at .05 level = 1.96.

*Significant at P<.05.

Summary

The numbers of instructors in 10 demographic subgroups were reported followed by listings as ranked by the subpopulation of instructors.

The research questions were answered by making eight comparisons of subpopulations or instructor subgroups. In six of the eight comparisons, a significant difference was found between groups of mean ratings.

CHAPTER V.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The first four chapters of this study dealt with the background, methodology, analysis and findings of this research. The purpose of this chapter is to summarize the preceding chapters, draw conclusions based on the findings, and present a list of recommendations.

Summary

Restatement of the problem

The problem of this study was to determine the congruence between the competencies in evaluation perceived as needed by vocational instructors and the competencies included in vocational teacher education courses in evaluation.

Restatement of the purpose

The purpose of this study was to determine: (1) vocational instructors' needs in evaluation and (2) whether those needs are being met by professional evaluation courses.

A review of the literature provided a foundation for this study. The review was divided into four sections. The first section dealt with theoretical models of evaluation. Cronbach (1963) and Stufflebeam (1973) saw evaluation as a decision-making process. Cronbach felt that measurement procedures used to obtain data for the decision-making process should be non-specific, thus allowing unsuspected information to

be gathered. Stufflebeam theorized that there are four elements of evaluation: context evaluation, input evaluation, process evaluation, and product evaluation.

Scriven's (1967) theory dealt with the roles of evaluation which he called formative and summative. Formative evaluation is carried out while the program is still in its developmental stages: summative evaluation is concerned with the completed program. Moss's (1968) evaluation model for occupational education outlined four major characteristics which must be considered in the evaluation process. Moss theorized that product evaluation was superior to process evaluation because many of the processes have not been adequately validated.

The second section of the review dealt with vocational program evaluation. The six general characteristics covered were: (1) process evaluation, (2) product evaluation, (3) evaluation by objectives, (4) cost-benefit evaluation, (5) cost-effectiveness evaluation, and (6) statewide systems of evaluation.

The third section reviewed the literature concerned with student measurement relative to norm-referenced and criterion-referenced measures. Various characteristics inherent to each kind of measurement were covered and a comparison was made between the forms based on these characteristics.

The last section reviewed the competency-based teacher education movement. General definitions as well as specific information concerning vocational education were covered. The occupational analysis technique of defining and delineating competencies was discussed relative to vocational education. A study by Cotrell et al. (1971) was regarded as

the most comprehensive study done in identifying vocational teacher competencies.

The procedure chapter identified the steps followed in completing the study. An instrument was designed based upon two prior studies, Cotrell et al. (1971) and Resnick et al. (1977), concerned with the competencies needed by postsecondary vocational instructors. The instrument was administered to four subpopulations with a total of 121 subjects. Ninety-nine of the subjects responded.

The subpopulation of instructors was further divided into demographic subgroups. Mean ratings for each subpopulation and subgroup were calculated for the 21 competencies or subcompetencies. The exception to this was the group of ratings from the Iowa Department of Public Instruction which yielded only one rating per competency.

The Mann-Whitney U-Test was utilized to test for differences in the mean ratings of eight subpopulation or instructor subgroup comparisons. The eight comparisons were tested in answering the four research questions.

The findings of this study were reported in the form of answers to the four research questions. It was determined that a significant difference existed between subpopulations or instructor subgroups in six of the eight comparisons. Supplementary data were reported in Appendices E and F.

Conclusions

The conclusions of this study are presented in relation to the research questions. The supplementary conclusion is based upon the ranking of the competencies by the instructors.

Question 1

Postsecondary trade and industrial and technical vocational instructors in Iowa perceive that less proficiency is needed in evaluation competencies than the proficiency specified in the industrial vocational teacher education courses in evaluation.

Discussion This is supported by the findings which show that the mean ratings of the competencies by the instructors are lower in all but one competency than the mean ratings by the industrial vocational teacher educators. At the same time, there is a high positive correlation ($r = .73$) between the rankings of the competencies by the two subpopulations. (See Appendix F.) This correlation indicates that there is a high, positive relationship between the subpopulations as to the relative importance of the competencies.

Question 2

The proficiency perceived as needed by postsecondary trade and industrial and technical instructors in Iowa in evaluation competencies does not differ from the proficiency specified in an interpretation of Iowa's minimum teacher certification requirements for vocational instructors.

Discussion Since only one instrument was administered to the State Department of Public Instruction, no recommendation based upon the findings was made.

Question 3

Postsecondary trade and industrial and technical instructors in Iowa perceived that less proficiency in evaluation competencies is needed than the proficiency perceived as needed by the personnel development coordinators in Iowa's Area schools.

Discussion There is a positive correlation ($r = .35$) between the rankings of the competencies by the two subpopulations. (See Appendix F.) While there is a positive relationship between the subpopulations as to the relative importance of the competencies, the relationship is not as great as the relationship between the instructors' and industrial vocational teacher educators' rankings.

Question 4

The following five conclusions are based on the findings relating to question four and are applicable to postsecondary trade and industrial and technical instructors in Iowa.

1. Instructors with more than four years of vocational teaching experience perceive that more proficiency is needed in evaluation competencies than instructors with less than four years vocational teaching experience.
2. Instructors with a baccalaureate degree in education perceive that more proficiency is needed in evaluation competencies

than instructors with a baccalaureate degree not in education.

3. Instructors with a baccalaureate degree perceive that more proficiency is needed in evaluation competencies than instructors with no degree.
4. The proficiency perceived as needed by trade and industrial instructors in evaluation competencies does not differ from the proficiency perceived as needed by technical instructors.
5. Instructors who had completed a professional course in evaluation perceived that more proficiency is needed in evaluation competencies than instructors who had not completed such a course.

Discussion In all of the above cases, a high, positive correlation existed between the rankings of the competencies by the subgroups. (See Appendix F for r in each comparison.) These correlations indicate that a high, positive relationship exists between the rankings in the five demographic pairs.

Supplementary Conclusion

Postsecondary trade and industrial and technical instructors in Iowa perceive the important aspects of evaluation as being broader than the construction of paper and pencil cognitive tests and the ability to analyze those tests.

Discussion

The five highest rated competencies dealt with: (1) the establishment of criteria for evaluation, (2) the development of evaluation procedures for laboratory performance, (3) the comparison of student progress against student performance objectives, (4) the development of instrumentation for assessing students' personal traits and work habits, and (5) the ability to adjust instruction based on feedback from students. Among the highest rated competencies were those which deal with the decision-making process in evaluation.

Recommendations

Primary 1 Secondary Rec

The recommendations of this study are presented in two parts. The first part contains recommendations based upon the findings and conclusions; the second part contains recommendations for additional research related to this study.

Part 1

1. The performance levels specified in the objectives for industrial vocational teacher education courses in evaluation in Iowa should be adjusted in terms of the proficiency perceived as needed by the subpopulation of instructors.
2. The personnel development coordinators in Iowa's Area schools need to become more aware of the evaluation needs of instructors so as to aid in coordinating the professional development of trade and industrial and technical instructors in the schools.

3. Vocational teacher educators should make the students in evaluation courses aware of the proficiency levels specified in the performance objectives and of the source of the levels.

4. Vocational teacher education courses in evaluation should place more emphasis on the competencies ranked highest by the instructors.

Part 2

5. A study should be undertaken to determine if and in what competencies trade and industrial and technical instructors feel they need help in attaining the proficiency they perceive as needed in evaluation.

6. Similar studies should be undertaken relative to the following professional vocational courses: (1) occupational analysis, (2) teaching methods, and (3) foundations of vocational education.

7. Similar studies should be undertaken to determine the evaluation needs of instructors in the following vocational service areas: (1) agriculture, (2) health occupations, (3) distributive education, (4) business and office education, and (5) home economics, to determine if differences and similarities do exist.

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To my major advisor, Bob Gelina, thank you for your help and encouragement, and for setting a high standard of professionalism which helped me learn and become a better person.

To my master's committee, Joe Kupfer, William Wolansky, John VanAst and Bob Gelina, thank you for the time you sacrificed to help me gain an education of which I am very proud.

Finally, this thesis is dedicated to my parents, Mrs. Iliff L. Leu and the late Iliff L. Leu. Thank you for your love, support, and guidance which have helped me to get where I am.

Don Leu

APPENDIX A: EVALUATION COMPETENCIES

Evaluation Competencies

Cotrell et al. (1971)

IV. Evaluation of Instruction

139. Establish criteria for student performance.

140. Formulate a system of grading consistent with school policy.

141. Appraise students' products according to occupational performance standards.

142. Appraise students' performance in relation to student performance objectives.

143. Evaluate individualized assignments completed under directed study.

144. Devise self-evaluation techniques for use by students.

145. Arrange for students to evaluate their own progress.

146. Engage in cooperative evaluation of achievement with students.

147. Determine students' grades based on related instruction and laboratory or on-the-job experience.

148. Interpret students' evaluation of instruction.

149. Formulate essay test items.

150. Formulate true-false test items.

151. Formulate completion test items.

152. Formulate matching test items.

153. Formulate multiple-choice test items.

154. Devise laboratory performance tests.

155. Devise laboratory performance rating sheets.

156. Formulate test items for an oral test.

157. Administer teacher-made tests.

158. Devise case study problems.

159. Analyze tests for validity.

160. Analyze tests for reliability.

161. Review student progress and/or achievement records to assess effectiveness of instruction.

162. Involve students in formulating the procedures for their participation in the evaluation of instruction.

163. Obtain information from fellow teachers and supervisory personnel regarding the quality of one's instruction.

164. Seek opportunities for self-evaluation of instruction.

Validated Evaluation Competencies

Resnick and Carmody (1977)

IV. Evaluation of Instruction

52. Formulate a grading system consistent with school policy. Establish criteria for evaluating student performance based upon classroom instruction and laboratory (or on-the-job) experience.

53. Evaluate the entire instructional program. Measure student progress against the student performance objective.

54. Develop a system for measuring student progress that will incorporate cognitive, affective, and psychomotor objectives.

55. Consider the cumulative data regarding student ability and past achievement in evaluating current performance.

*56. Locate and utilize available standardized tests to measure achievement.

57. Develop an instrument to evaluate the students' work, work attitude, qualities, personal traits, and progress on the job.

58. Appraise student products according to occupational performance objectives.

59. Appraise student products in relation to student performance objectives.

60. Evaluate individual assignments completed through directed study against student performance objectives.

61. Arrange for students to evaluate their own progress and devise self-evaluation techniques for them to use.

62. Work with students to cooperatively evaluate student performance against criterion measures (such as those identified in competencies 58, 59, and 60).

63. Develop cognitive tests related to the instructional objectives. Use essay type, true/false, completion, matching, and multiple choice test items.

64. Develop a system for analyzing test results to measure both student progress and the validity and reliability of the test.

65. Develop a system for measuring laboratory performance that includes an assessment of student progress, laboratory performance tests, laboratory performance rating sheets, and assessment of student-made products.

66. Develop a system of testing students orally, using both teacher-made tests and commercially available products.

67. Develop case study situations to test student problem solving ability.

68. Develop a system for self-evaluation of the instructional process. Assess student progress and/or achievement, and involve the students in the evaluation process. Obtain information from fellow teachers and supervisory personnel.

69. Adjust instructional plans and strategies based on observed feedback from students.

*No consensus on categorical placement; item remains in category to which it was originally assigned.

APPENDIX B: COVER LETTERS

JANUARY 10, 1978

DONALD W. LEU
IOWA STATE UNIVERSITY
IND. ED. BLDG. C
AMES, IOWA 50011

DEAR MR. LEU:

THIS SURVEY IS BEING CONDUCTED TO TRY AND DETERMINE WHAT YOU, AS A VOCATIONAL INSTRUCTOR, FEEL YOUR NEEDS ARE IN STUDENT AND PROGRAM EVALUATION. YOUR ASSISTANCE IS VERY IMPORTANT AND GREATLY APPRECIATED.

MY BACKGROUND IN VOCATIONAL EDUCATION INCLUDES TWO YEARS OF TEACHING AUTOMECHANICS FOR KIRKWOOD COMMUNITY COLLEGE AND A BACHELORS DEGREE IN INDUSTRIAL EDUCATION FROM IOWA STATE UNIVERSITY. I AM CURRENTLY WORKING ON MY MASTERS DEGREE IN INDUSTRIAL VOCATIONAL TECHNICAL EDUCATION AND TEACHING FOR IOWA STATE.

THIS QUESTIONNAIRE SHOULD TAKE NO LONGER THAN 10 MINUTES TO COMPLETE. IT WILL BE GREATLY APPRECIATED IF YOU CAN TAKE THE TIME TO GO THROUGH IT AS SOON AS POSSIBLE AND RETURN IT IN THE ENCLOSED ENVELOPE.

IF YOU WOULD LIKE A COPY OF THE RESULTS OF THIS STUDY, PLEASE RETURN THIS LETTER WITH THE INSTRUMENT. IF NOT, DETACH THIS LETTER BEFORE RETURNING THE THE QUESTIONNAIRE.

SINCERELY YOURS,

DONALD W. LEU
IOWA STATE UNIVERSITY

JANUARY 20, 1978

DONALD W. LEU
IOWA STATE UNIVERSITY
IND. ED. BLDG. 0
AMES, IOWA 50011

DEAR MR. LEU:

RECENTLY I SENT YOU A QUESTIONNAIRE DESIGNED TO DETERMINE YOUR NEEDS IN EVALUATION. AS OF YET I HAVE NOT RECEIVED THE COMPLETED INSTRUMENT. IT IS VERY IMPORTANT THAT I RECEIVE THIS QUESTIONNAIRE AS YOUR INPUT WILL HELP BETTER DETERMINE THE NEEDS IN EVALUATION OF VOCATIONAL INSTRUCTORS.

FOR YOUR CONVENIENCE, I HAVE ENCLOSED ANOTHER COPY OF THE QUESTIONNAIRE AND A RETURN ENVELOPE. PLEASE TAKE 10 MINUTES TO COMPLETE THE INSTRUMENT AND RETURN IT TO ME AS SOON AS POSSIBLE. IF YOU WOULD LIKE A COPY OF THE RESULTS OF THIS STUDY, PLEASE RETURN THIS LETTER WITH THE COMPLETED QUESTIONNAIRE. THANK YOU.

SINCERELY YOURS,

DONALD W. LEU
IOWA STATE UNIVERSITY

JANUARY 10, 1978

DONALD W. LEU
IOWA STATE UNIVERSITY
BLDG. O
AMES, IOWA 50011

DEAR MR. LEU:

THIS SURVEY IS BEING CONDUCTED TO TRY AND BETTER DETERMINE WHAT COMPETENCIES TRADE AND INDUSTRIAL AND TECHNICAL VOCATIONAL INSTRUCTORS NEED TO EVALUATE THEIR STUDENTS AND PROGRAM. IT IS FELT THAT YOUR INPUT WILL AID IN BETTER UNDERSTANDING WHAT COMPETENCIES ARE NEEDED.

YOU WERE IDENTIFIED BY OUR STAFF AS BEING THE INDIVIDUAL DESIGNATED AS PERSONNEL DEVELOPMENT COORDINATOR AT YOUR AREA SCHOOL. YOUR ASSISTANCE IN THIS SURVEY ISVERY IMPORTANT AND GREATLY APPRECIATED.

PELASE TAKE TEN MINUTES AND COMPLETE THIS INSTRUMENT AS SOON AS POSSIBLE. AS YOU READ THROUGH THE QUESTIONNAIRE YOU WILL NOTICE THAT THE DIRECTIONS ARE WRITTEN FOR VOCATIONAL INSTRUCTORS. YOU SHOULD RATE EACH COMPETENCY ACCORDING TO THE PROFICIENCY "YOU" FEEL T&I AND TECHNICAL INSTRUCTORS SHOULD HAVE.

IF YOU WOULD LIKE A COPY OF THE RESULTS OF THIS STUDY, PLEASE RETURN THIS LETTER WITH THE COMPLETED INSTRUMENT AS SOON AS POSSIBLE. THANK YOU.

SINCERELY YOURS,

DONALD W. LEU
IOWA STATE UNIVERSITY

Interoffice Communication 82

IOWA STATE UNIVERSITY
of Science and Technology

DATE December 15, 1977

TO Whom it May Concern

FROM William D. Wolansky
Professor and Head
Department of Industrial Education

This memo is to verify that Mr. Donald Leu, who is an instructor and graduate student in the Department of Industrial Education is conducting a research study to determine how well our course in evaluation is serving the trade and industrial and technical instructors.

Please support this research effort of Don Leu. He is the son of Iliff Leu, and I believe will become an outstanding leader in vocational education. The results of his research will benefit all of us. Will you please take the necessary time to complete and return this questionnaire.

Thank you for your cooperation.

APPENDIX C: INSTRUMENT

Assessment of Evaluation Needs of Trade and Industrial and Technical Vocational Instructors

General Instructions

The purpose of this questionnaire is to determine what competencies you feel you need to be able to adequately evaluate your students and program.

Your assistance in completing this survey is very important and greatly appreciated. You will remain completely anonymous although coding numbers are used on each questionnaire to identify who has returned the completed instrument.

Please follow the instructions given and return the completed questionnaire in the enclosed envelope within two weeks if possible.

Background Information

1. Check one of the following which best describes your connection with vocational education.
   ____ A. Trade and Industrial or Technical Teacher
   ____ B. Vocational Teacher Educator
   ____ C. Personnel Development Coordinator (or designated as)

   If you checked 1A, answer items 2-5.
   If you checked 1B or 1C, go on to the next page.

2. Check the response which best describes the amount of teaching experience you have had in vocational-technical education.
   ____ A. Less than four years
   ____ B. More than four years

3. Do you have a bachelors degree? Yes____ No____
   If yes, was your major or minor in education?
   Yes____ No____

4. Which of the following best identifies your service area in vocational-technical education? Check the appropriate response.
   ____ A. Trade and Industrial (Automechanics, welding, etc.)
   ____ B. Technical (Mechanical tech., electronics tech.)

5. Have you completed any of the following courses? If so, check the courses you have completed.
   ____ A. Foundations of Vocational Education
   ____ B. Teaching Methods in Vocational Education
   ____ C. Evaluation in Vocational Education
   ____ D. Occupational Analysis and Course Construction

6. Please indicate the Area school in which you are currently employed.

____ I	____ VI	____ XII
____ II	____ VII	____ XIII
____ III	____ XI	____ XIV
____ IV	____ X	____ XV
____ V	____ XI	____ XVI

Please rate the following activities according to your needs in the classroom. Rate each activity using the following as a guide:

1. I need no proficiency in this activity
2. I need slight proficiency in this activity
3. I need moderate proficiency in this activity
4. I need considerable proficiency in this activity
5. I need complete proficiency in this activity

Please do not leave out any item --- there are no right or wrong answers. We are mainly concerned with what YOU perceive as your needs in evaluation.

Here is an example:

1. Provide student instructional activities and organizational information for substitute teachers. 1 2 3 4 (5)

This person, in marking the "5" rating, felt that he/she needed complete proficiency in this activity.

What proficiency do you feel you need as a teacher in the ability to:

		no proficiency	slight proficiency	moderate proficiency	considerable proficiency	complete proficiency
1.	Formulate a grading system consistent with school policy. Establish criteria for evaluating student performance based upon classroom instruction and laboratory (or on the job) experience.	1	2	3	4	5
2.	Evaluate the entire instructional program. Measure student progress against the student performance objective.	1	2	3	4	5
3.	Develop a system for measuring student progress that will incorporate cognitive, affective, and psychomotor objectives.	1	2	3	4	5

4.	Consider the cumulative data regarding student ability and past achievement in evaluating current performance.	1	2	3	4	5
5.	Locate and utilize available standardized tests to measure achievement.	1	2	3	4	5
6.	Develop an instrument to evaluate the students' work, work attitude, qualities, personal traits and progress on the job.	1	2	3	4	5
7.	Appraise student products according to occupational performance standards.	1	2	3	4	5
8.	Appraise student products in relation to student performance objectives.	1	2	3	4	5
9.	Evaluate individual assignments completed through directed study against student performance objectives.	1	2	3	4	5
10.	Arrange for students to evaluate their own progress and devise self-evaluation techniques for them to use.	1	2	3	4	5
11.	Work with students to cooperatively evaluate student performance against criterion measures (such as those identified in competencies 7, 8, and 9).	1	2	3	4	5
12.	Develop cognitive tests related to the instructional objectives. Use essay type, true/false, completion, matching and multiple choice test items.	1	2	3	4	5
13.	Develop a system for analyzing test results to measure both student progress and the validity and reliability of the test.	1	2	3	4	5
14.	Develop a system for measuring laboratory performance that includes an assessment of student progress, laboratory performance tests, laboratory performance rating sheets, and assessment of student-made products.	1	2	3	4	5
15.	Develop a system of testing students orally, using both teacher-made items and commercially available products.	1	2	3	4	5

16.	Develop case study situations to test student problem-solving ability.	1	2	3	4	5
17.	Develop a system for self-evaluation of the instructional process. - - -	1	2	3	4	5
	Assess student progress and/or achievement, and involve the students in the evaluation process. - - - - -	1	2	3	4	5
	Obtain information from fellow teachers and supervisory personnel. - - -	1	2	3	4	5
18.	Adjust instructional plans and strategies based on observed feedback from students.	1	2	3	4	5

APPENDIX D: INSTRUMENT VALIDATION EXPERTS

Instrument Validation Experts

1. Dr. Robert J. Gelina	Associate Professor of Industrial Education Iowa State University Coordinator of Graduate Studies
2. Dr. John VanAst	Assistant Professor of Industrial Education Iowa State University Technical Education Section
3. Dr. William D. Wolansky	Professor and Head Department of Industrial Education

APPENDIX E: MEAN RATINGS AND RANKINGS OF THE COMPETENCIES OR SUBCOMPETENCIES BY SUBPOPULATION AND SUBGROUP COMPARISON

Ranks and Mean Ratings of Instructors and Teacher Educators

Instructors			Teacher Educators		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	3.87	*1	2	4.80
2	15	3.69	*2	8	4.80
*3	3	3.61	*3	9	4.80
*4	7	3.61	*4	3	4.60
5	21	3.56	*5	13	4.60
6	4	3.54	*6	15	4.60
*7	8	3.49	*7	21	4.60
*8	13	3.49	*8	7	4.40
*9	10	3.47	*9	12	4.40
*10	18	3.47	*10	1	4.20
11	1	3.45	*11	10	4.20
12	14	3.32	*12	18	4.20
13	19	3.32	13	19	4.00
14	9	3.30	*14	4	3.80
*15	11	3.23	*15	11	3.80
*16	17	3.23	*16	14	3.80
17	12	3.22	*17	17	3.80
18	5	3.08	*18	5	3.40
19	20	3.05	*19	6	3.40
20	16	2.99	*20	16	3.40
21	6	2.52	21	20	2.80

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Instructors and the Department of Public Instruction

Instructors			Department of Public Instruction		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Rating
1	2	3.87	*1	13	5
2	15	3.69	*2	19	5
*3	3	3.61	*3	2	4
*4	7	3.61	*4	3	4
5	21	3.56	*5	8	4
6	4	3.54	*6	9	4
*7	8	3.49	*7	10	4
*8	13	3.49	*8	11	4
*9	10	3.47	*9	12	4
*10	18	3.47	*10	15	4
11	1	3.45	*11	16	4
12	14	3.34	*12	21	4
13	19	3.32	*13	1	3
14	9	3.30	*14	4	3
*15	11	3.23	*15	6	3
*16	17	3.23	*16	7	3
17	12	3.22	*17	14	3
18	5	3.08	*18	17	3
19	20	3.05	*19	18	3
20	16	2.99	*20	20	3
21	6	2.52	21	5	2

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Instructors and Personnel Development Coordinators

Instructors			Personnel Development Coordinators		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	3.87	1	1	4.64
2	15	3.69	2	2	4.14
*3	3	3.61	*3	10	4.00
*4	7	3.61	*4	21	4.00
5	21	3.56	5	9	3.92
6	4	3.54	6	8	3.86
*7	8	3.49	7	15	3.79
*8	13	3.49	8	13	3.71
*9	10	3.47	*9	19	3.57
*10	18	3.47	*10	20	3.57
11	1	3.45	*11	11	3.50
12	14	3.34	*12	12	3.50
13	19	3.32	*13	14	3.50
14	9	3.30	*14	16	3.50
*15	11	3.23	*15	7	3.36
*16	17	3.23	*16	17	3.36
17	12	3.22	*17	3	3.29
18	5	3.08	*18	4	3.29
19	20	3.05	19	18	3.14
20	16	2.99	20	5	3.00
21	6	2.52	21	6	2.64

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Instructors Separated by Vocational Teaching Experience

More Than Four Years Experience			Less Than Four Years Experience		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	4.03	1	2	3.50
2	3	3.89	*2	7	3.29
3	15	3.81	*3	15	3.29
4	21	3.77	4	18	3.25
5	4	3.72	5	3	3.21
6	13	3.68	*6	4	3.17
*7	7	3.66	*7	8	3.17
*8	8	3.66	*8	1	3.12
9	10	3.62	*9	10	3.12
*10	1	3.60	*10	19	3.12
*11	18	3.60	*11	9	3.08
12	9	3.5	*12	11	3.08
13	14	3.51	*13	13	3.08
14	17	3.45	*14	21	3.08
15	19	3.42	15	14	3.00
16	11	3.30	16	12	2.92
17	12	3.2	17	5	2.89
*18	5	3.15	18	20	2.83
*19	16	3.15	*19	16	2.75
*20	20	3.15	*20	17	2.75
21	6	2.51	21	6	2.54

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Instructors Separated by Type of Baccalaureate Degree

With Degree in Education			With Degree Not in Education		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
*1	2	4.21	1	2	4.08
*2	8	4.21	2	15	3.83
*3	9	4.21	3	4	3.75
4	15	4.16	4	8	3.67
5	21	4.10	*5	1	3.58
*6	3	4.05	*6	3	3.58
*7	10	4.05	*7	7	3.58
*8	7	4.00	*8	10	3.58
*9	13	4.00	9	13	3.50
*10	19	4.00	10	12	3.42
11	4	3.89	*11	14	3.33
*12	1	3.84	*12	21	3.33
*13	18	3.84	13	18	3.25
14	20	3.68	*14	17	3.17
15	14	3.63	*15	19	3.17
16	17	3.47	16	9	3.16
17	12	3.42	*17	20	3.00
18	11	3.37	*18	5	3.00
19	5	3.21	19	16	2.92
20	16	3.00	*20	6	2.83
21	6	2.21	*21	11	2.83

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Degreed and Non-Degreed Instructors

Degree			Non-Degree		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	4.16	1	2	3.67
2	15	4.03	*2	7	3.47
3	8	4.00	*3	15	3.47
*4	3	3.87	4	3	3.43
*5	10	3.87	5	21	3.39
*6	4	3.84	6	18	3.37
*7	7	3.84	7	4	3.35
*8	9	3.81	*8	11	3.28
*9	13	3.81	*9	13	3.28
*10	21	3.81	10	1	3.26
11	1	3.74	11	14	3.22
12	19	3.68	12	10	3.20
13	19	3.61	*13	8	3.15
14	14	3.52	*14	17	3.15
*15	12	3.42	*15	12	3.09
*16	20	3.42	*16	19	3.09
17	17	3.35	17	5	3.04
18	11	3.16	18	16	3.00
19	5	3.13	19	9	2.96
20	16	2.97	20	20	2.80
21	6	2.45	21	6	2.56

[1]*Indicates a tied rank.

[2]Number of competency or subcompetency.

Ranks and Mean Ratings of Instructors Separated by Service Area

Technical			Trade and Industrial		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	4.00	1	2	3.80
2	13	3.92	2	15	3.69
*3	3	3.69	3	4	3.61
*4	15	3.69	4	7	3.59
*5	1	3.65	*5	3	3.57
*6	7	3.65	*6	21	3.57
*7	10	3.65	7	18	3.51
*8	5	3.54	8	8	3.47
*9	8	3.54	*9	11	3.45
*10	21	3.54	*10	19	3.45
11	9	3.50	11	10	3.37
12	14	3.46	12	1	3.35
*13	4	3.42	*13	13	3.27
*14	12	3.42	*14	14	3.27
15	18	3.38	15	17	3.25
16	17	3.19	16	9	3.20
17	20	3.15	17	16	3.14
18	19	3.08	18	12	3.12
19	6	2.85	19	20	3.00
20	11	2.81	20	5	2.84
21	16	2.69	21	6	2.35

[1]*Indicates a tied rank.

[2]Number of competencies or subcompetencies.

Ranks and Mean Ratings of Instructors With and Without Professional Evaluation Course

Without Course			With Course		
Rank[1]	Number[2]	Mean Rating	Rank[1]	Number[2]	Mean Rating
1	2	3.58	1	2	4.00
*2	8	3.50	2	15	3.77
*3	15	3.50	3	21	3.70
*4	3	3.46	*4	3	3.68
*5	7	3.46	*5	7	3.68
6	18	3.42	6	4	3.66
7	17	3.33	7	1	3.62
*8	4	3.29	8	13	3.58
*9	10	3.29	9	10	3.55
*10	13	3.29	*10	8	3.49
*11	9	3.25	*11	18	3.49
*12	12	3.25	12	14	3.40
*13	19	3.25	13	19	3.36
*14	21	3.25	*14	39	3.32
15	14	3.21	*15	11	3.32
16	1	3.08	16	12	3.21
*17	11	3.04	17	17	3.19
*18	20	3.04	18	5	3.11
19	5	3.00	19	20	3.06
20	16	2.96	20	16	3.00
21	6	2.46	21	6	2.56

[1]*Indicates a tied rank.

[2]Number of competencies or subcompetencies.

APPENDIX F: RANK CORRELATIONS OF SUBPOPULATIONS AND INSTRUCTOR SUBGROUP COMPARISONS

Rank Correlations of Subpopulations and Instructor Subgroup Comparisons

Comparison	Rank correlation coefficient
Instructors and teacher educators	.73
Instructors and D.P.I.	.33[1]
Instructors and coordinators	.35
Instructors according to experience	.80
Instructors according to type of degree	.71
Degreed and non-degreed instructors	.67
Instructors according to service area	.50
Instructors according to completion of evaluation course	.74

[1] An approximation due to the number of tied ranks in the D.P.I. ratings.

APPENDIX G: EQUATIONS FOR THE MANN-WHITNEY U-TEST

U-observed

$$U_1 = N_1N_2 + \frac{N_1(N_1 + 1)}{2} - R_1, \quad U_2 = N_1N_2 + \frac{N_2(N_2 + 1)}{2} - R_2$$

Where N_1 = number of cases in group 1.

N_2 = number of cases in group 2.

R_1 = sum of the ranks of cases in group 1.

R_2 = sum of the ranks of cases in group 2.

z-observed

$$\frac{U_o - \frac{N_1N_2}{2}}{\sqrt{\frac{(N_1 + N_2 + 1)\ N_1N_2}{12}}}$$